

CIL
EMU CRITICAL ITEMS LIST

12/24/94 SUPERSEDES 12/24/93

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Date: 11/15/95

ANALYST:

NAME	P/N	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
DCM ELECTRONICS, ITEM 350	SV792291-27 (1)	2/2	350FM23: Loss of CL2V (Item 171) Electrical Power.	END ITEM: Loss of power to Item 171.	A. Design - Semiconductor failure is minimized through the use of high reliability components. Established reliability capacitors (Level S) and resistors (Level R) are used and are qualified to the requirements of their respective MIL specs and thermal shocked per condition B of MIL-STD-202 Method 107. The transistors and diodes are qualified to the requirements of MIL-S-19500 and receive the burn-in of JANITXV level parts per the applicable methods, 1038, 1039 and 1040, of MIL-STD-730. The electronic components are operating within the power derating requirements of SVHS 7804. The printed circuit boards are polyimide per MIL-P-13949 Type II and manufactured per SN-P-0006. Parts mounting and soldering is per NSFC--STD-136 and NMN5300. 4 (3A-1). The board assemblies are hard mounted to the DCM case to provide a thermal transfer path between the board heat sinks and the case to direct heat away from the electronic components. The board assemblies are also conformal coated per MIL-A-46146 (Dow Corning RTV 3140) for environmental protection. All wiring used in the DCM is M22759/11 (teflon insulated). Soldering is per NMN5300. 4 (3A-1) and wire crimping is per SVHS 4909 (based on MSC-SPEC-D-1A). All wires are strain relieved. Electrical connectors are environmentally sealed to prevent damage due to contamination and humidity.
			CAUSE: Electronic component failure, faulty solder joint failure, broken connection output printed circuit trace shorts to ground.	GFE INTERFACE: Unable to change position of 171 valve. If closed, loss of cooling loop degas capability. May not be able to start pump.	
				MISSION: Terminate EVA prep.	
				CREW/VEHICLE: None.	

B. Test -

In-Process Test -

The DCM electronics assembly is tested during initial build-up: at the board assembly level, after the PC boards have been interwired, and after installation of the boards wiring, and after installation of the front cover. These tests consists of continuity through the switches and wiring, voltage checks, functional check of all current limiters, and full operation of the DCM electronics. The tests insure proper operation of the DCM electronics.

POA TEST -

Vibration testing per SEMU-60-015 followed by continuities and full function, testing verifies the integrity of the solder joints and crimp connections in the DCM. The random vibration level for this test is 6.6 grms for a duration of 1 minute per axis for each of the three orthogonal

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NAME P/N QTY	FAILURE MODE & CAUSES CRIT	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE												
2/2	350FM231		<p>axes. (JESD SPEC SP-1-0023).</p> <p>Thermal vacuum testing followed by full functional electrical testing per SEMU-60-015 also verifies the solder joints as well as the acceptability of the components. The DCM is placed in a vacuum chamber at 1×10^{-3} torr. The DCM case temperature is cycled 3 times from 70 to 130 degree F. At the end of the third cycle, the temperature is held between 130 and 135 degree F for a minimum of four hours. The DCM display must remain on throughout the test. This verifies proper transfer of heat from the electronics to the DCM case to prevent over heating of components.</p> <p>Certification Test -</p> <p>The Liquid Crystal Display version of the DCM electronics assembly (Item 390, SV792291-7), as part of the full DCM Item 300 (Items 350 and 385 combined), was successfully subjected to levels of vibration and shock equivalent to those experienced over a fifteen (15) year life.</p> <table> <tr> <td>Random Flight Vibration</td> <td>1.625 g rms</td> <td>48 min/axis</td> </tr> <tr> <td>Sinusoidal Flight</td> <td>1 g rms.</td> <td>3-35 Hz ea.</td> </tr> <tr> <td>Vibration</td> <td></td> <td>axis</td> </tr> <tr> <td>Design Shock</td> <td>6.5 g rms.</td> <td>11 ms/peak</td> </tr> </table>	Random Flight Vibration	1.625 g rms	48 min/axis	Sinusoidal Flight	1 g rms.	3-35 Hz ea.	Vibration		axis	Design Shock	6.5 g rms.	11 ms/peak
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The LED display version of the DCM electronics Assembly (Item 350, SV792291-9) was subjected to certification testing between June and August of 1986 with the exception of ENI which occurred in September of 1985. The testing verified the basic integrity and flight worthiness of the redesign DCM configuration (Item 300, SV792294). The item 350 completed qualification vibration (7.8 g rms, 6 minutes per axis) as a separate item, and structural vibration (1.625 g rms, 48 minutes per axis), and shock testing as part of the full DCM item 300 (Item 350 combined with Item 385). The DCM/300 also completed the four hour thermal vacuum certification at 35 degree F. No class 1 EC's have been incorporated into this version of the DCM since certification was completed.

C. Inspection -

100% inspection of all soldering (PCB boards and wiring) by Hamilton Standard QA and DCAS QA. All board assemblies are inspected for damage and contamination. All wiring is inspected for damage, nicks in the insulation, wear, and

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ANALYST:

NAME	FAILURE	MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
P/H QTY	CRIT	2/2	350FM231	strain relief. The DCM is internally inspected after installation of the circuit boards and wiring to insure no damage has occurred during assembly.

D. Failure History -
None.

E. Ground Turnaround -
Operation of current limiter is verified per FEMU-R-001,
Water Servicing, Leakage, and Gas Removal.

F. Operational Use -
Crew Response - PreEVA: No response required if pump startup and coolant flow can be initiated. If cooling insufficient, troubleshoot using pump priming valve. If cooling still insufficient EMU go for SCU without fan. PostEVA: No response, single failure undetectable by crew or ground.
Training - Standard training covers this failure mode.
Operational Considerations - EVA checklist procedures verify hardware integrity and systems operational status prior to EVA. Flight rules define go/no go criteria related to EMU C/S.